



The Duwamish Valley Climate Resilience Survey

Stacking sandbags to reduce Duwamish River flooding – January 2023. Image credit: BJ Cummings



Public Health
Seattle & King County



ENVIRONMENTAL
& OCCUPATIONAL
HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH
UNIVERSITY of WASHINGTON



Seattle

PROJECT TEAM AND AUTHORS

Duwamish River Community Coalition

- **Paulina López**, Executive Director
- **Adrienne Hampton**, Climate Justice Manager
- **Carmen Martinez**, Duwamish Valley Youth Corps Manager

City of Seattle

- **Alberto Rodríguez**, Duwamish Valley Advisor, Office of Sustainability and Environment

Public Health–Seattle & King County

- **Bradley Kramer**, Climate + Health Equity Initiative, Co-Manager

Washington State Department of Health

- **Erika Estrada**, Community Preparedness and Recovery Coordinator

University of Washington

- **Ann Bostrom**, Weyerhaeuser Endowed Professor of Environmental Policy, Evans School of Public Policy & Governance
- **BJ Cummings**, Community Engagement Co-Manager, Interdisciplinary Center for Exposures, Diseases, Genomics, and Environment (EDGE Center), Department of Environmental & Occupational Health Sciences
- **Cat Hartwell**, Research Coordinator, Collaborative on Extreme Event Resilience, Department of Environmental & Occupational Health Sciences
- **Jeffrey Berman**, Professor, Department of Civil & Environmental Engineering, RAPID Center Operations Director
- **Tania Busch Isaksen**, Associate Teaching Professor, Department of Environmental & Occupational Health Sciences; Co-Director, Collaborative on Extreme Event Resilience
- **Lisa Hayward**, Community Engagement Co-Manager, EDGE Center, Department of Environmental & Occupational Health Sciences
- **Nicole Errett [Principal Investigator]**, Assistant Professor, Department of Environmental & Occupational Health Sciences; Co-Director, Collaborative on Extreme Event Resilience; Community Engagement Core Director, EDGE Center
- **Pamela Kohler**, Associate Professor, Department of Global Health, Co-Director, Center for Global Health Nursing, Senior Technical Advisor, I-TECH
- **Resham Patel**, Assistant Teaching Professor, Department of Environmental & Occupational Health Sciences (*Formerly Organizational Preparedness & Evaluation Manager at Public Health – Seattle & King County*)
- **Sam Lovell**, Masters of Public Health Student, Department of Environmental & Occupational Health Sciences
- **Jamie Vickery**, Research Scientist, Collaborative on Extreme Event Resilience; Disaster Research Response (DR2) Community Engagement Program Manager, EDGE Center, Department of Environmental & Occupational Health Sciences



Several members of the SASPER team. (From left): Jamie Vickery, Resham Patel, Paulina López, Alberto Rodríguez, and BJ Cummings. Image credit: Matias Korfmacher

CONTENTS

Project description | 1

Survey process | 2

Survey results | 4

Demographics | 5

Issues of concern | 7

Sources of information | 9

Social connectedness | 10

Health | 11

Resilience planning | 12

South Park flooding event | 16

Climate impact listening sessions | 17

Streetview data collection | 18

Implications | 19

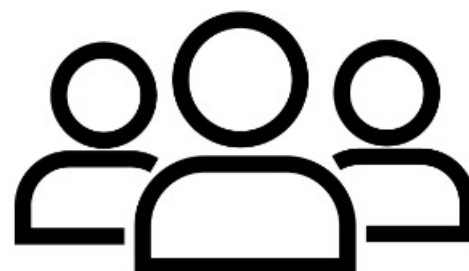
Next steps | 20

Limitations | 21

Funding | 21

Appendix 1: Survey | 22

Appendix 2: Data | 23





UW and DVYC volunteers surveying. Image credit: Paulina López

PROJECT DESCRIPTION

The Seattle Assessment for Public Health Emergency Response (SASPER) is a collaboration among the University of Washington (UW), Washington State Department of Health, Public Health–Seattle & King County, the City of Seattle, the non-profit community-based organization Duwamish River Community Coalition (DRCC), and DRCC’s Duwamish Valley Youth Corps. The SASPER aims to better understand community strengths, needs, and priorities for climate change and disasters in the Duwamish Valley communities of South Park and Georgetown in Seattle. These neighborhoods are home to racially and ethnically diverse and low-income communities: South Park’s non-white population is nearly twice the Seattle average and 40% of its residents speak a language other than English, compared to approximately 20% citywide. The Duwamish Valley communities experience a disproportionate share of climate change impacts in the region; for example, approximately 80% of lands that are projected to be impacted by sea level rise in Seattle are in the Duwamish Valley. In response, the City of Seattle is developing a Duwamish Valley Resilience District (DVRD) – a multistakeholder effort to advance environmental justice and racial equity in climate adaptation efforts in the Duwamish Valley. DRCC has also launched a Climate Justice program to advocate for just and equitable climate change adaptation policies for the Duwamish Valley. The results from the SASPER will inform future development of Seattle’s DVRD and DRCC’s Climate Justice advocacy initiatives, in addition to other local, state, and national practice-based and academic initiatives.

SURVEY PROCESS

SASPER Questionnaire

The City of Seattle has started planning for climate change in the Duwamish Valley to address community priorities and promote health equity. The plan is to establish a "Resilience District" in the Duwamish Valley – resilience means the ability to prepare for and manage the impacts of climate change tomorrow, while building on community strengths and promoting equity today. We will leave more information about this work with you, including contact information in case you have any questions. As we mentioned, we'll be asking you questions about hazards of concern, how you receive emergency communication, household information, and questions about climate and resilience planning. Please answer all the questions for your entire household; that means you and every member who regularly lives in this home.

Date: ____/____/____ Type of Structure: _____
Cluster Number: _____ Single family
Interview Number: _____ Multiple unit (e.g., apartment/condo)
Team Name: _____ Mobile home
Neighborhood: _____ South Park _____ Georgetown _____ Other: _____

1. To begin, we are going to read you a list of issues. Of these, please tell us the **top three** issues of concern to you and members of your household.

_____ Civil unrest _____ Healthcare access
_____ Cost of living _____ Housing affordability
_____ COVID-19 _____ Job security
_____ Crime or violence _____ Duwamish Superfund Site
_____ Environmental impacts on my household's health (e.g., air and water pollution, climate change, extreme heat and/or cold) _____ Racial and ethnic inequality
_____ Food security (access to healthy, affordable food) _____ Other (please explain): _____

2. Please tell us whether your household has a high, medium, or low level of concern about each of the following environmental hazards that may impact your health. Please also tell us whether you or your members of your household have experienced any of these hazards within the last 5 years.

	High	Medium	Low	Don't know	Experienced?	Refused
Contaminated local food sources						
Droughts or water shortages						
Earthquakes						
Extreme cold weather or severe winter storms						
Extreme heat						
Flooding from heavy rains and/or sea level rise						
Poor air quality/pollution						
Sewage overflow during rain incidents						
Wildfires						
Any other extreme weather or environmental incidents						

3. Next, we are going to read you a list of sources of information. Of these, please tell us your household's **top three** sources of information about disasters and environmental hazards in your neighborhood.

_____ Community health _____ Landline _____ Social media (e.g., Facebook, Twitter) _____ Other (explain): _____
_____ Clinic (e.g., SeaMar) _____ Radio _____ Text message/Cell phone alert _____
_____ Newspaper _____ Internet/Online news _____
_____ TV _____ Friends/Family/Word of mouth _____ Church/Place of worship _____
_____ Cell phone _____

4. Of these information sources, which does your household trust the **most**?

SASPER survey. Full survey in Appendix 1

The SASPER builds on the **Community Assessment for Public Health Emergency Response (CASPER)**

approach used by the U.S. Centers for Disease Control and Prevention (CDC) to conduct door-to-door surveys to assess pre- and post-disaster needs in impacted communities.

CASPER uses a two-stage sampling method in which census blocks, or "clusters" are selected across a neighborhood, and a certain number of households within each of the clusters are surveyed using a randomized process to ensure a representative sample.

We adapted the CASPER approach to center equity in the process. Adaptations made included:

- ✓ Translating the survey and all materials into the nine languages most commonly spoken in the Duwamish Valley,
- ✓ Providing survey volunteers access to an interpreter phone bank for live translation of additional languages encountered,
- ✓ Training and compensating local youth, including multi-lingual youth, to lead the survey teams,
- ✓ Compensating each surveyed household for participation in the study with a \$25 gift card, and
- ✓ Providing an opportunity for randomly selected households to participate in the survey online in either English or Spanish if a household member was not home at the time of the surveying.

The research team collectively developed the [survey](#) for the SASPER based on knowledge of the community and previous survey templates focused on climate and disaster hazards (survey also available in Appendix 1). The final SASPER survey included items focused on hazards of concern, emergency communication, household information, and climate and resilience planning.

We recruited volunteers from UW, the Public Health Reserve Corps, partner organizations, and the Duwamish Valley Youth Corps to participate in the surveying. A CDC representative provided two in-person trainings, one focused on preparing the youth volunteers and one targeted for adults, to explain the CASPER method to volunteers.

SURVEY PROCESS

On three different occasions in October and November 2022, volunteers conducted door-to-door surveys in South Park and Georgetown, including two Saturday mornings and one Thursday afternoon. To increase representation and participation, the team also provided the opportunity for several households that were not available during repeated visits to complete the survey online. Unhoused individuals who live in the Duwamish Valley were included through surveys administered at a local food bank, which some unhoused residents had registered as their mailing address during the most recent census.

We then summarized the percentage of households that provided different responses to each survey question and adjusted the data using CDC's survey weighting procedures to improve its accuracy in understanding how well it represents the community of interest.

No direct comparisons can be made between Georgetown and South Park responses due to the limitations in the survey methodology. However, we do provide anecdotal descriptive differences between neighborhoods. These observations require additional research to confirm.



SASPER volunteers conducting surveying. Image credit: Paulina López

Members of the Duwamish Valley Youth Corps and other volunteers surveyed 167 households over 3 days.

SURVEY RESULTS

We present results from data collected from 162 households (including seven unhoused respondents) in the Duwamish Valley. 130 of these surveys were collected during our door-to-door outreach, and an additional 32 were collected online.

Another five surveys were excluded from the results as they were collected outside of the randomized CASPER cluster approach. The results have been weighted according to CDC's methods for a CASPER survey.

As previously noted, we provide anecdotal neighborhood-level differences observed in the data collected from participating South Park and Georgetown households; however, more research is necessary to confirm the accuracy of those comparisons at the neighborhood levels. As such, the neighborhood-level observations use the raw data, which has not been adjusted using CDC's weighting methods.

Survey Collection Method

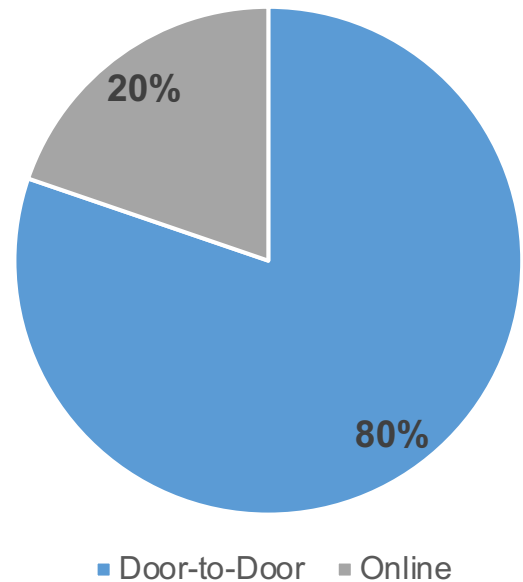
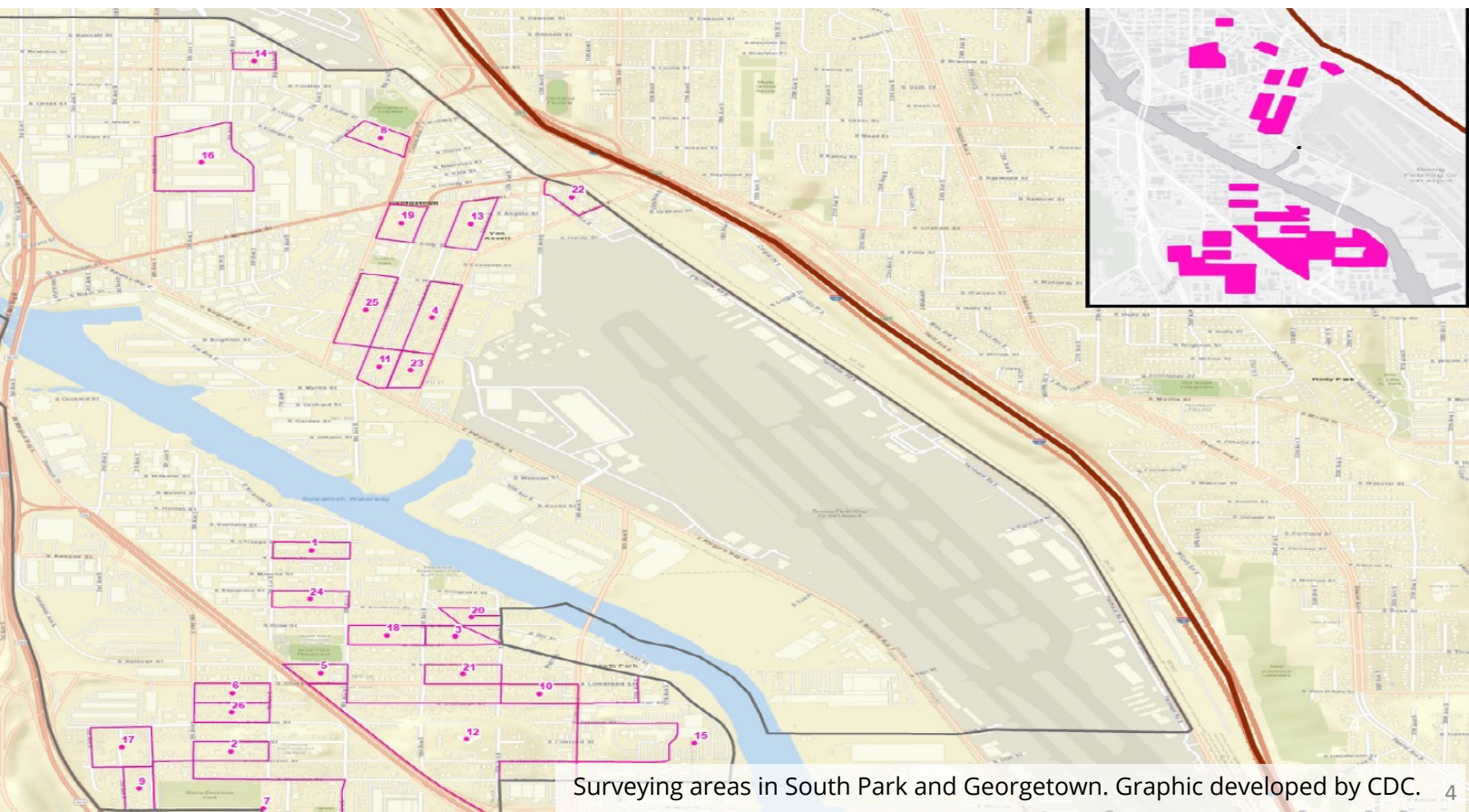


Figure 1. Method for collecting surveys



Demographics

The majority of surveyed households reported that at least one member of the household was white (72%). In order of higher to lower percentages, 19% of households reported that at least one member identified as Hispanic/Latino/Latinx, 14% as Asian, 13% as mixed race, and 5% as Black/African American (note that the total exceeds 100% because some households had members of more than one race/ethnicity). See Table 1 (next page) for summarized details.

Twelve of the surveys were completed in Spanish, and one each in Khmer, Vietnamese, and Chinese. The interpreter phone bank was used at least once to complete a survey with a community member who spoke Khmer.

Anecdotally, it appears that a higher percentage of participating South Park households reported that at least one member of the household was Black/African American, Hispanic/Latino/Latinx, or mixed race/ethnicity than participating Georgetown households, while a higher percentage of participating Georgetown households reported at least one member of the household was white or Asian.

While we cannot directly compare these results to the census (as our results simply describe whether at least one member of a household identifies as a particular race or ethnicity, not the proportion of residents within the community that identify as a particular race or ethnicity), it does appear that households with white-identifying members may be over-represented and several non-white racial/ethnic groups may be underrepresented in the survey results.

Completed Survey Languages

The majority of surveys were completed in English. However, several surveys were conducted in other languages, including:

- Spanish (12 surveys)
- Khmer (1 survey)
- Vietnamese (1 survey)
- Chinese (1 survey)



The interpreter phone bank was used at least once for the surveying.

Demographics, continued

Demographic Survey Question	Percent of Households*	Range***
Racial/ ethnic composition of household** <i>(household has at least one member that identifies as the race/ ethnicity)</i>		
Asian	14%	9% - 21%
Black/ African American	5%	2% - 9%
Hispanic/ Latino/ Latinx	19%	10% - 31%
White	72%	63% - 81%
Mixed	13%	8% - 20%
Age composition of household <i>(household has at least one member in the age bracket)</i>		
Less than 2 years old	7%	3% - 14%
2-17 year old	21%	14% - 29%
18-64 years old	87%	82% - 91%
65+ years old	14%	9% - 22%

Table 1. Demographics of surveyed households

*Percentages have been rounded to the nearest percent

** Response options with five or fewer responses have not been weighted, including the following racial/ ethnic categories: American Indian/ Alaska Native and Native Hawaiian or Other Pacific Islander.

*** The range represents the values above and below which we have strong certainty the actual percentage of households is. This range is called the 95% confidence interval.

With regards to age composition, the majority of households had at least one member in the 18-64 year age cohort. 21% of households had at least one member aged 2-17 years old, 14% 65 years or older, and 7% less than two years old.

Anecdotally, it appears that a higher percentage of participating South Park households reported that at least one member of their household was age 2-17 than participating Georgetown households.

Issues of Concern

The three issues most frequently cited in the top three concerns for households surveyed were environmental impacts, crime, and cost of living.

The top issue of concern for participating Georgetown households was crime, while environmental impacts tops the participating South Park households' list of concerns.



What are the top three issues of concern for your household?

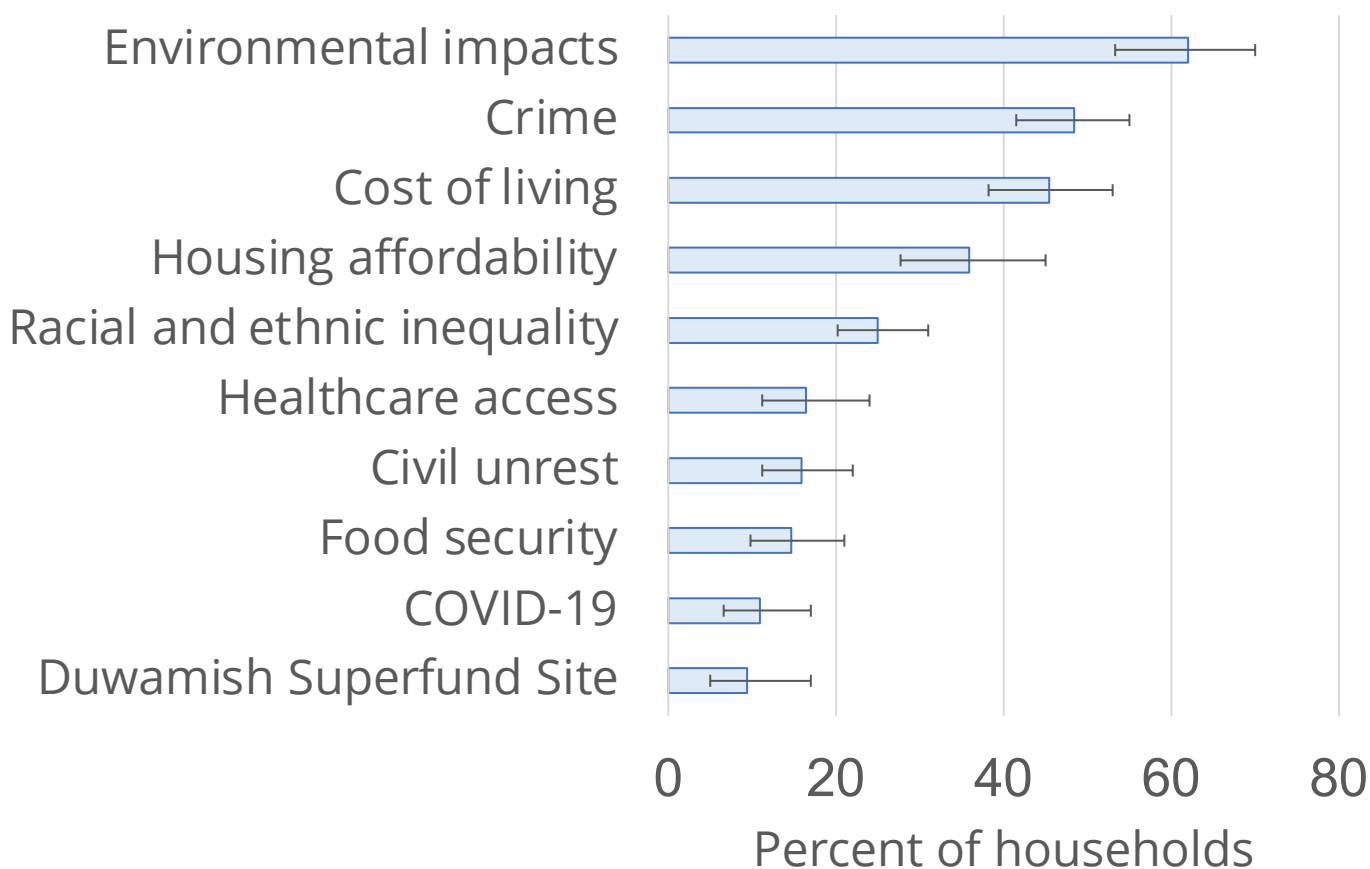


Figure 2. Issues of concern. Full data for the figure is provided in Appendix 2.

Environmental hazards

When asked to rate their level of concern about specific hazards, poor air quality, extreme heat, and wildfires were among the highest reported hazards of concern, with a large percentage of respondents having reported experiencing these hazards (59%, 57%, and 42%, respectively). Notably, the top three hazards specifically associated with climate change were extreme heat, wildfires (which contribute to poor air quality) and flooding from heavy rains and/or sea level rise.

Hazards versus impacts

Environmental hazards refers to an **event** (such as a flood) which has the potential to harm health.

Environmental impacts refers to the **impact** of these events (such as harm to human health).

While it appears that there were no major differences noted in the level of concern for environmental hazards between participating households in South Park and Georgetown, anecdotally, a larger percentage of participating South Park households ranked flooding as a higher level of concern than did participating Georgetown households. It is worth noting that these responses were collected in October and November 2022; a major flood occurred in South Park in December 2022. It is likely that flooding would have been ranked even higher if the survey had been conducted after this flood occurred.

Hazards rated of "high concern" by households

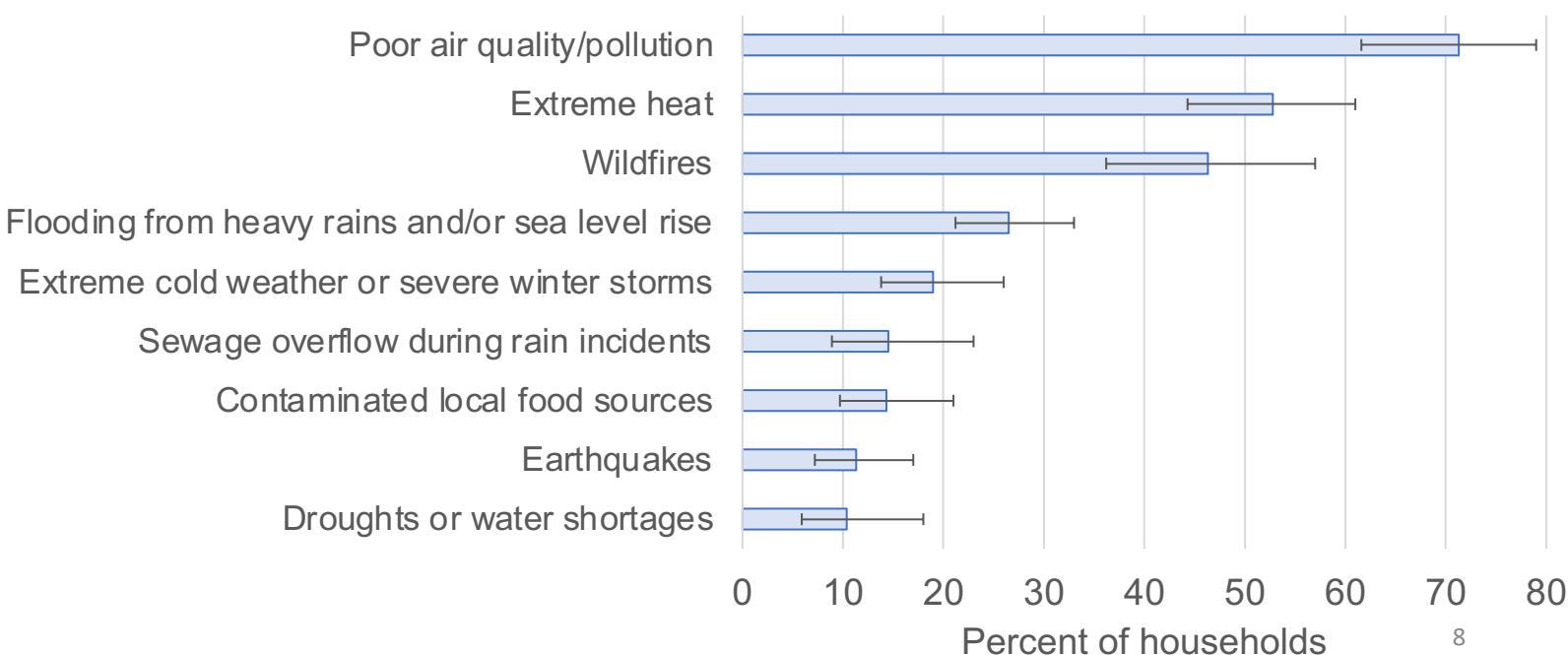


Figure 3. Hazards of concern. Full data for the figure is provided in Appendix 2.

Sources of Information

Households reported that they most frequently relied on the internet, social media, and friends/ family/ word of mouth for information about disasters and environmental hazards. Other sources of information that households reported using included radio (e.g., NPR, KNKX), podcasts, government websites, accredited news sites, social media sites of neighborhood groups, community meetings (e.g., Georgetown Community Council), and scientific publications.

Of these sources, households reported that they trusted information the most that they received from the internet (30%, range of 23%-38%), followed by TV (15%, 9%-23%), radio (10%, 5%-16%) and friends, family, and word of mouth (9%, 5%-17%).

Anecdotally, it appears that a higher percentage of participating Georgetown households cited the internet as a top source of information than did participating South Park households. Only participating South Park households cited the community health clinic and church or place of worship (which is not included in the figure as fewer than 5 respondents cited it as a top source) as top sources of information.

What are your top 3 information sources about disasters/ environmental hazards?

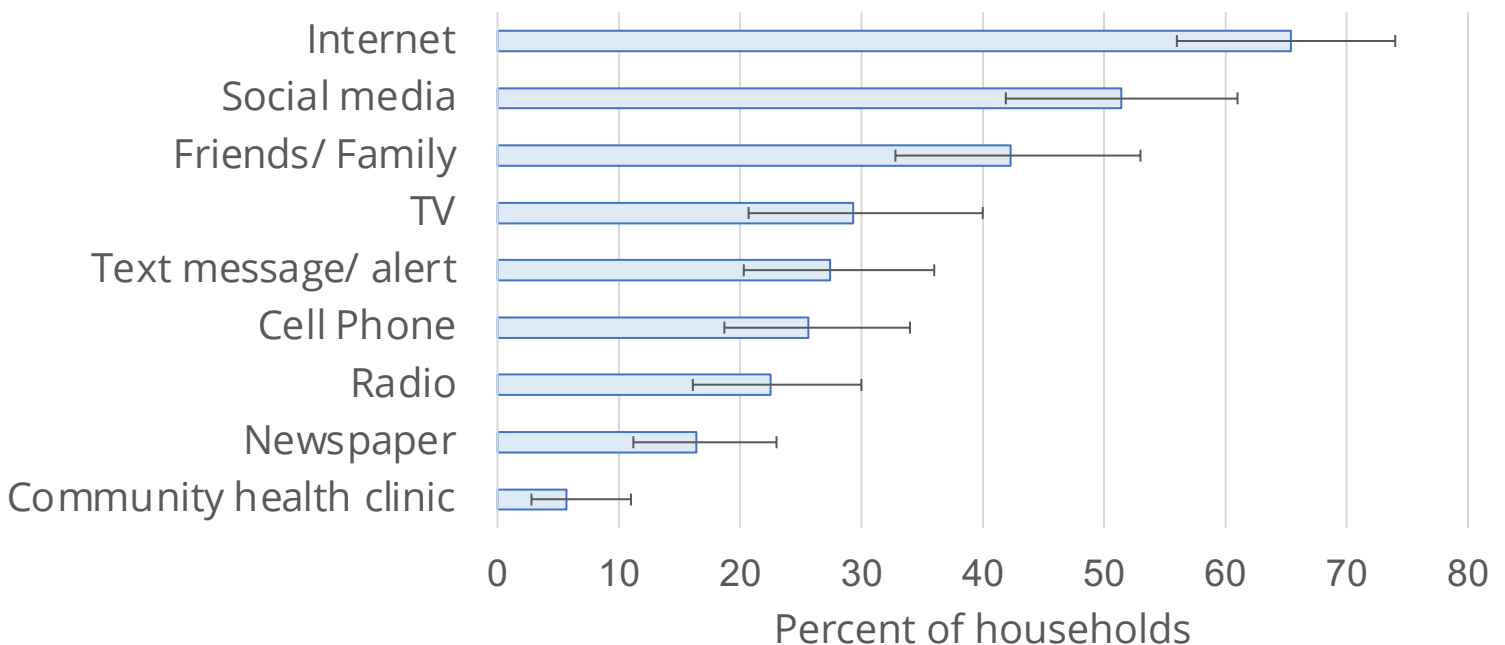


Figure 4. Information sources. Full data for the figure is provided in Appendix 2.

Social Connectedness

A majority of Duwamish Valley households agreed or strongly agreed that their neighborhood has a strong sense of community (64%) and that they have people nearby to call when they need help (69%).

There were no major differences observed, anecdotally, between participating South Park and Georgetown households in responses to these statements.

Our neighborhood has a strong sense of community (strongly disagree to strongly agree)

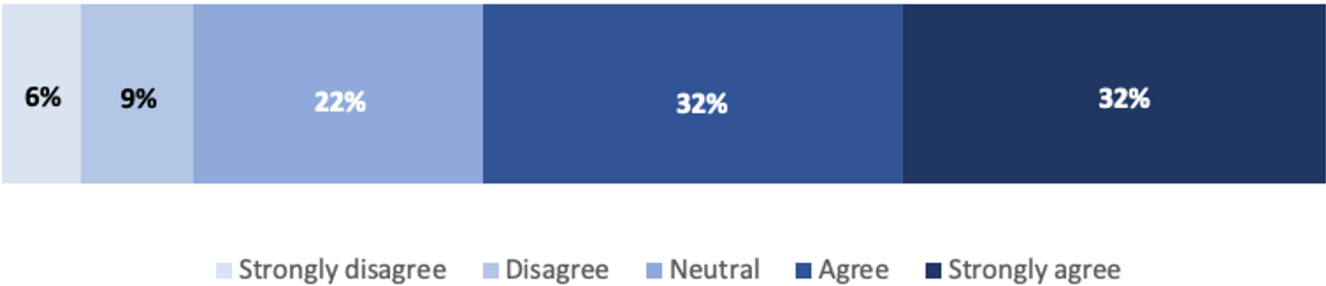


Figure 5. Sense of community: Ranges for categories: Strongly disagree (3 - 13); Disagree (4 - 17); Neutral (16 - 30); Agree (24 - 40); and Strongly agree (25 - 39)

Our household has people nearby we can call when we need help (strongly disagree to strongly agree)

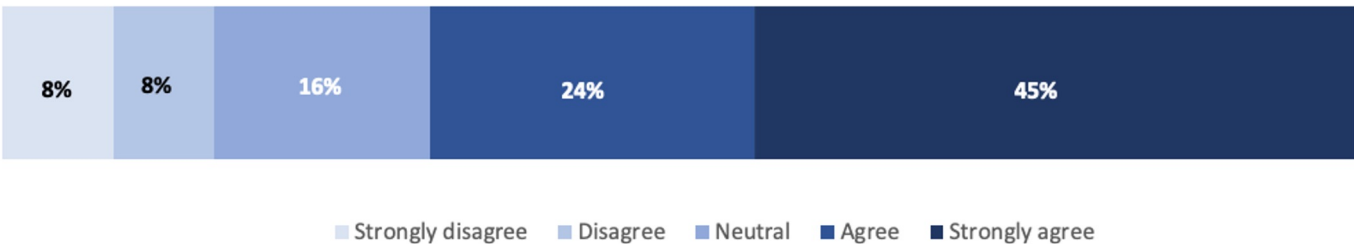


Figure 6. Nearby help: Ranges for categories: Strongly disagree (5 - 14); Disagree (5 - 12); Neutral (11 - 23); Agree (15 - 35); and Strongly agree (37 - 52)

Health

Approximately half (46%, range of 37-55%) of surveyed households reported that at least one member of the household has a health condition that could be worsened in a disaster or environmental hazard. Ten percent (range of 7-16%) reported someone in their household requires medical equipment or supplies that relies on electricity.

Health Vulnerability Survey Question	Percent of Households*	Range
Does anyone in your household have a health condition that you think could be worsened in a disaster or an environmental hazard?		
Yes	46%	37% - 55%
No	50%	41% - 59%
Do you or someone in your household require medical equipment or supplies that require electricity?		
Yes	10%	7% - 16%
No	87%	81% - 92%

Table 2. Health vulnerability survey responses





Dancers at Duwamish River Festival. Image credit: BJ Cummings

Resilience

When asked which actions should be prioritized to increase climate and community resilience in their community, households identified community-centered/led projects, green infrastructure (for example, permeable pavements, tree planting, and other infrastructure that manages water and/or reduces heat), and flood protection as top actions. Importantly, the City of Seattle has a history of funding community-centered projects in the Duwamish Valley (examples available [at Seattle's Duwamish River Opportunity Fund](#)), so community members may be most familiar with this activity.

Which 3 actions should be prioritized to increase climate and community resilience in your community?

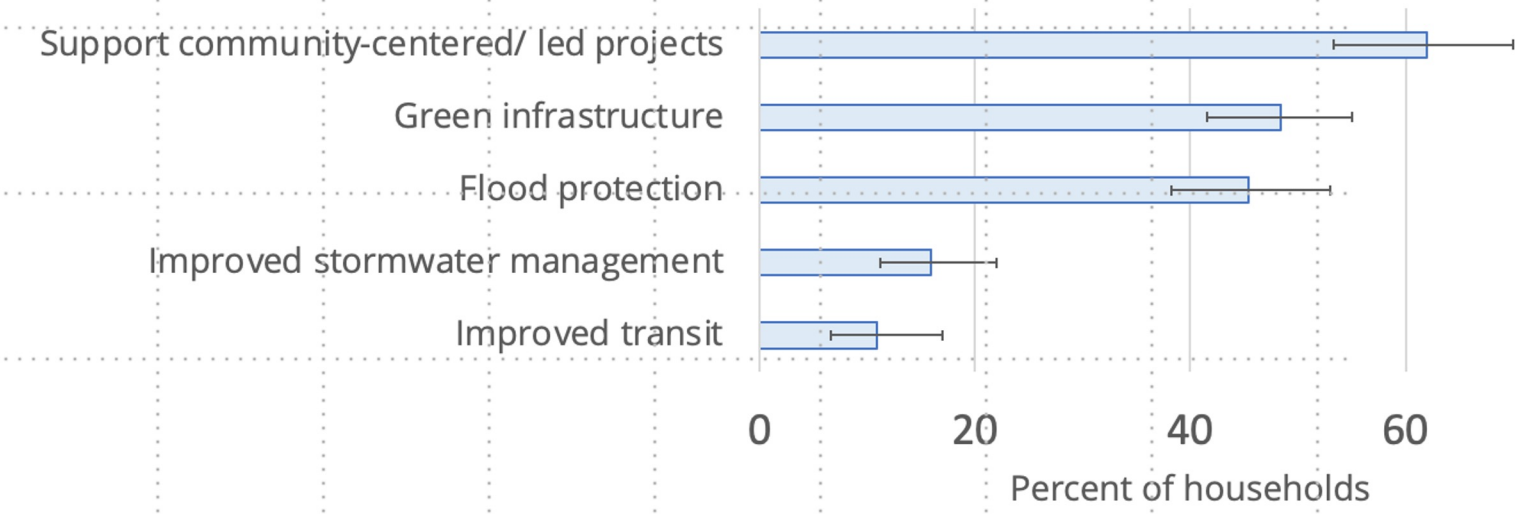


Figure 7. Resilience action priorities. Full data for the figure is provided in Appendix 2

Duwamish Valley Resilience District

The survey provided information about the City of Seattle's Duwamish Valley Resilience District (DVRD) work, including the city's plans to establish Resilience Hubs in the Duwamish Valley in 2023 and 2024. Resilience Hubs are publicly- and community-owned buildings that can provide services during emergencies.

47% of households indicated willingness to get involved with DVRD work (range of 35-58%).

- **36%** were interested in getting involved through **virtual community forums** (range of 27% - 46%).
- **24%** were interested in getting involved through **in-person community forums** (range of 17% - 33%).
- **19%** were interested in getting involved through a **community advisory group** (range of 13% - 25%).



Would you or any member of your household use a Resilience Hub during an emergency?

■ Yes ■ No ■ Did not answer

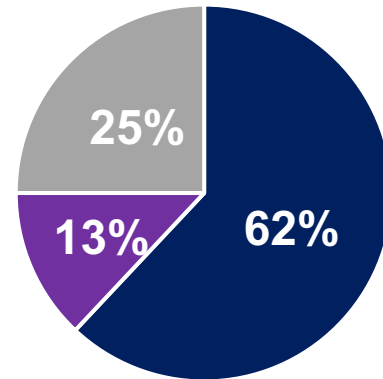


Figure 8. Perceived future use of Resilience Hubs in the Duwamish Valley

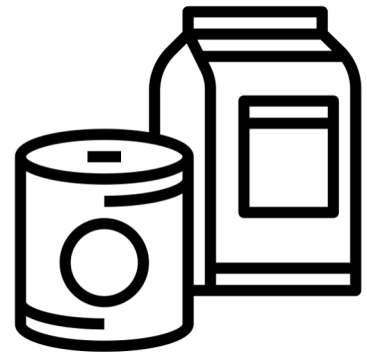
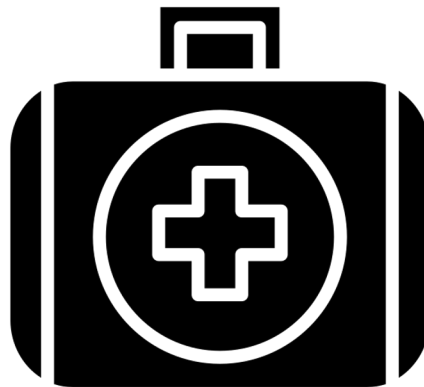
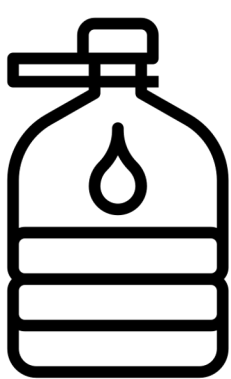
62% of households said that they would use a Resilience Hub during an emergency (range of 51% - 72%).

Anecdotally, a higher percentage of participating South Park households reported willingness to get involved with DVRD work and that they would use Resilience Hubs than did participating Georgetown households.

What should be offered in the Resilience Hubs?

Households identified the following resources, services, and activities as important to include in Resilience Hubs:

- Basics (particularly food and water, as well as clothing, shelter, restrooms, and first aid);
- Social services (e.g. social workers), counseling, addiction assistance;
- Information;
- Internet, charging stations;
- Volunteer opportunities to help others;
- Games, distractions from the emergency; and
- Supplies: sandbags, low-cost heating and cooling options, propane, generators, emergency blankets.



What does your household believe is the single most important thing that resilience planners should know about preparing the Duwamish Valley community for climate change?

“The people that live in this area like to be kept in the loop and not have things forced upon them without input from the community. We can be a mighty force of action and support as long as we feel included and aware of what is going on.”

- Duwamish Valley community member

Households surveyed recommended that resilience planners should consider the following:

- **Community engagement and outreach**, including engaging community in discussions about needs and solutions, information sharing, education, and ensuring solutions are community-led.
- **Community connectedness**, including recognition that the community is close-knit and resilient.
- **Diversity of community**, including acknowledgement that there are multiple languages spoken, and diverse needs, including those of the unhoused.
- **Gentrification**, and awareness that the neighborhood is changing.
- **Environmental practices**, including water conservation, improving food sovereignty through local food growing, and enhancing green infrastructure.
- **Environmental issues**, including those related to air quality, the Duwamish River Superfund Site, extreme heat, wildfires, sewers, flooding, earthquakes, and the cumulative impacts of diverse hazards.
- **Other specific issues described by survey respondents**, such as transportation, crime and safety, food security.

“Trust between neighbors is the single most important thing.”

- Duwamish Valley community member



Flooding following the King Tide event. Image credit: BJ Cummings

SOUTH PARK FLOODING EVENT

In late December 2022 (following the completion of the SASPER surveys in October and November 2022) an extreme high (“King”) tide compounded by heavy rains and an unusually low-pressure system caused the Duwamish River to overtop its banks and flood a portion of the South Park neighborhood. The flooded area included industrial and commercial zoned businesses and a residential neighborhood with a large number of low-income Khmer and Hispanic/Latino/Latinx residents. More than 40 households were impacted by the flooding, and more than two dozen were temporarily (and some permanently) displaced.

Seattle Public Utilities (SPU) and multiple other City of Seattle departments, with support from the Duwamish River Community Coalition, Red Cross, King County Khmer Community Services, Villa Comunitaria, Cultivate South Park, and others deployed emergency services to assist the impacted residents and businesses. Displaced families received hotel vouchers and all impacted residents received cash assistance, storage pods, meal support, and use of bathroom, shower, and laundry facilities in temporary onsite trailers. Prior to another King tide anticipated for the following month, SPU deployed 90,000 sandbags to prevent flooding in case the river overtopped its banks again; the sandbags will remain in place indefinitely while a long-term solution is found to protect against future flooding.

The community will continue working closely with the City and other government entities to find the best short- and long-term solutions for climate resilience and emergency preparedness.

Climate Impact Listening Sessions

In response to the impact and associated trauma of the December floods, the SASPER partners elected to replace a series of planned research-oriented focus groups with more informal trauma-informed listening sessions (“climate impact debriefs”) in order to facilitate community conversations about shared concerns, needs, and community-driven solutions to climate change impacts in their neighborhoods. With the leadership and facilitation of the Duwamish River Community Coalition, two listening sessions were hosted in South Park on February 16 and 18, 2023, in English and Spanish, respectively, and one in English in Georgetown on March 7, 2023.

Common themes heard throughout the listening sessions were the need to develop community-based **mutual aid networks** within the South Park and Georgetown neighborhoods and the need for a **rapid communication network** to alert residents of impending or active disasters (e.g., floods, heat waves, earthquakes, etc.). Ideas for a communication network included phone trees and a network of trusted households (ideally, one per block) that would serve as resource centers for material assistance and information during disaster events.

Needs identified:

- Mutual aid networks
- Rapid communication network
 - Training
- Hubs for support
- Planning for climate

The Spanish speaking community in South Park suggested using a WhatsApp neighborhood channel for communications, while Georgetown residents recommended using the existing “Gazette” neighborhood newsletter distribution network to contact every household during an emergency.

Listening session participants also highlighted the need for emergency response **training** in advance of future disasters. Participants also discussed the need for centralized emergency, resilience, and/or community health “**hubs**” to provide material support and services (including mental health) during disasters and the need to collectively engage in long-term **planning for climate adaptation**, e.g., through the City’s Duwamish Valley Resilience District.

Other topics discussed included financing for climate adaptation and placekeeping/anti-displacement, renters’ rights, encouraging neighborhood “stoop culture” through community-building activities, and developing a database of available resources and services.

Streetview Data Collection

Documenting the impact of the flooding on the Duwamish Valley is critical for informing future approaches to climate adaptation. To this end, the SASPER team worked with the UW's RAPID Facility, a National Science Foundation-supported research facility (NSF Award Number 2130997) that provides researchers with equipment and support for gathering data on the impacts of natural hazards (<https://rapid.designsafe-ci.org/>). The RAPID Facility supplied a Streetview camera system mounted on a car (as seen below) and then toured the neighborhoods where the SASPER was conducted following the flood. The images were processed by the RAPID Facility and shared via Mapillary which provides an immersive 3D streetview environment.* While the imagery could not be collected during the storm, the aftermath of the flooding is evident in many of the images.



The intersection of 8th Ave S and S Chicago St where the Duwamish River Community Coalition set up a support tent for the flooding.

Image credit: RAPID Facility

The RAPID Facility's Streetview car touring the Duwamish Valley.

Image credit: RAPID Facility



*See Mapillary images [here](https://deohs.washington.edu/edge/duwamish-valley-resilience-planning) and linked to on the UW SASPER webpage (<https://deohs.washington.edu/edge/duwamish-valley-resilience-planning>).

IMPLICATIONS

Key takeaways from the SASPER include:

1. Duwamish Valley community members are highly concerned about environmental hazards, the impacts of which are being worsened by climate change.

Absent climate change, the Duwamish Valley community faces high exposure to pollution, including from the Duwamish River, heavy industry, three highways, and two airport flight paths. The survey results indicate that environmental and climate hazards are a high priority for community members, who are deeply concerned about air pollution, including worsened air quality from wildfires, extreme heat, and flooding.

2. There is a strong sense of community and connectedness within the Duwamish Valley.

The majority of community members surveyed agreed that their neighborhoods have a strong sense of community and that their households have people nearby they can call when they need help. Community connectedness and capacity are critical elements of efforts to build more resilient communities that are able to withstand and adapt to the impacts of climate change.

3. Community members voiced strong support and desire to be involved in resilience building efforts.

The majority of community members surveyed were interested in being involved in ongoing and future efforts to build resilience in the Duwamish Valley. This includes interest in using a Resilience Hub if needed during a disaster.



NEXT STEPS

Moving forward, the results of the survey will support future efforts by the project partners, informing the City of Seattle and DRCC's efforts to build resilience in the Duwamish Valley, including through the DVRD and Resilience Hubs in collaboration with the communities of Georgetown and South Park, and providing lessons learned regarding community-engaged disaster needs assessments for the University of Washington and Public Health–Seattle & King County.

Uses and impacts of SASPER data by project partners



Figure 9. How SASPER partners are using the SASPER data and the impacts of the project. For example, local governments are using the SASPER data to inform their strategies for the Duwamish Valley Resilience District.

Next steps in this process include reporting back to the community, and an evaluation of the project*. The team also hopes to apply the approach in other contexts and communities in the future.

* The evaluation will be added to this report as an appendix when complete.

LIMITATIONS

Importantly, the SASPER survey approach has some limitations that impact how the results can be used. Specifically, and as described previously, the data do not accurately capture differences between the South Park and Georgetown neighborhoods, as it was designed to collect information representative of the community at the level of the Duwamish Valley as a whole. In other words, information collected from participating households in each neighborhood is not necessarily representative of the people that live in that one neighborhood. However, where possible, we make anecdotal comparisons in the report about trends observed in the data collected in each neighborhood. These comparisons need to be confirmed in the context of future research. Additionally, it is likely that the households that participated in the survey are not fully representative of the rich racial and ethnic diversity of the Duwamish Valley community.

FUNDING

Funding for this project was provided by the [UW EarthLab Innovation Grants](#), the [UW Interdisciplinary Center for Exposures, Diseases, Genomics, & Environment](#) (NIEHS Award Number P30ES007033), the [Cascadia Coastlines and Peoples Hazards Research Hub](#) (NSF Award Number 2103713) and the [UW RAPID Facility](#) (NSF Award Number 2130997).



National Institute of Environmental Health Sciences
Your Environment. Your Health.



EARTHLAB

UNIVERSITY of WASHINGTON



APPENDIX 1: SURVEY

SASPER Questionnaire

The City of Seattle has started planning for climate change in the Duwamish Valley to address community priorities and promote health equity. The plan is to establish a "Resilience District" in the Duwamish Valley – resilience means the ability to prepare for and manage the impacts of climate change tomorrow, while building on community strengths and promoting equity today. We will leave more information about this work with you, including contact information in case you have any questions. As we mentioned, we'll be asking you questions about hazards of concern, how you receive emergency communication, household information, and questions about climate and resilience planning. Please answer all the questions for your entire household; that means you and every member who regularly lives in this home.

Date: __/__/__

Cluster Number: _____

Interview Number: _____

Team Name: _____

Neighborhood: __ South Park __ Georgetown

Type of Structure:

__ Single family

__ Multiple unit (e.g., apartment/condo)

__ Mobile home

__ Other: _____

1. To begin, we are going to read you a list of issues. Of these, please tell us the **top three** issues of concern to you and members of your household.

__ Civil unrest

__ Cost of living

__ COVID-19

__ Crime or violence

__ Environmental impacts on my household's

health (e.g., air and water pollution, climate change, extreme heat and/or cold)

__ Food security (access to healthy, affordable food)

__ Healthcare access

__ Housing affordability

__ Job security

__ Duwamish Superfund Site

__ Racial and ethnic inequality

__ Other (please explain): _____

__ Refused

2. Please tell us whether your household has a *high, medium, or low level of concern* about each of the following environmental hazards that may impact your health. Please also tell us whether you or your members of your household *have experienced any of these hazards within the last 5 years*.

	High	Medium	Low	Don't know	Experienced?	Refused
Contaminated local food sources						
Droughts or water shortages						
Earthquakes						
Extreme cold weather or severe winter storms						
Extreme heat						
Flooding from heavy rains and/or sea level rise						
Poor air quality/pollution						
Sewage overflow during rain incidents						
Wildfires						
Any other extreme weather or environmental incidents _____						

3. Next, we are going to read you a list of sources of information. Of these, please tell us your household's **top three sources of information** about disasters and environmental hazards in your neighborhood.

__ Community health clinic (e.g., SeaMar)

__ Newspaper

__ TV

__ Cell phone

__ Landline

__ Radio

__ Internet/Online news

__ Friends/Family/Word of mouth

__ Social media (e.g.,

Facebook, Twitter)

__ Text message/Cell phone alert

__ Church/Place of worship

__ Other (explain): _____

__ Refused

4. Of these information sources, which does your household trust the **most**? _____

5. For each of the following statements we'll ask you to tell us your household's level of agreement on a scale from 1 to 5, where 1 is strongly disagree and 5 is strongly agree.
- Our neighborhood has a strong sense of community. _____ (1-5) _____ Refused
 - Our household has people nearby we can call when we need help. _____ (1-5) _____ Refused
6. Including yourself, how many people live in your household **right now**? _____
7. Including yourself, how many people in each of these age groups are in your household?
- _____ Less than 2 years old _____ 18-64 years old _____ Refused
- _____ 2-17 years old _____ 65+ years old
8. Please tell us the number of members of your household that identify as each of the following races or ethnicities:
(Interviewer Note: put the number of each next to the selected description)
- _____ American Indian/Alaska Native _____ White
- _____ Asian (e.g., Asian Indian, Chinese, Filipino, _____ Mixed: _____
- Japanese, Korean, Vietnamese – circle if indicated)) _____ Self Identify a choice not listed above: _____
- _____ Black or African American _____ Refused
- _____ Hispanic/Latino/Latinx
- _____ Native Hawaiian or Other Pacific Islander (e.g., Guamanian or Chamorro, Samoan)
9. Does anyone in your household have a health condition that you think could be worsened in a disaster or an environmental hazard (for example, wildfire smoke, earthquake, flooding)?
- Yes No Don't know Refused
10. Do you or someone in your household require medical equipment or supplies that require electricity?
- Yes No Don't know Refused
11. Which of the following actions should be prioritized to increase climate and community resilience in your community? **Please tell us the top three actions.**
- _____ Improved stormwater management to protect from floods caused by heavy rains
- _____ Flood protection caused by overtopping of the Duwamish River or sea level rise
- _____ Improved transit
- _____ Green infrastructure (for example, permeable pavements, tree planting) that manages water and reduces heat
- _____ Support community-centered/ community-led projects
- _____ Other: _____ Refused
12. How do you think community members would like to **receive information** about resilience planning, climate change adaptation, and the Duwamish Valley Resilience District effort? (Select all that apply)
- _____ Mailed newsletter
- _____ Emailed newsletter
- _____ Community forums/meetings (VIRTUAL)
- _____ Community forums/meetings (IN-PERSON)
- _____ Booths at local events
- _____ 1:1 meetings or "office hours"
- _____ Another method (Interviewer note: ask to please describe) _____ Refused
13. As we move forward with the Duwamish Valley Resilience District work, there will be opportunities to **get involved**, including by providing feedback at virtual and in-person meetings, and serving on a community advisory group. Would you or any member of your household like to be involved in Duwamish Valley Resilience District work?
- Yes No Don't know Refused
14. [If yes], How would you or a member of your household like to be involved in it? (Select all that apply)
- _____ Receive information and provide feedback through VIRTUAL community forums / meetings
- _____ Receive information and provide feedback through IN-PERSON community forums / meetings
- _____ Be part of a community advisory group that meets regularly and shapes the formation of the Duwamish Valley Resilience District. _____ Refused
- The City of Seattle** plans to establish "Resilience Hubs" in the neighborhood in 2023 and 2024. Resilience Hubs are publicly- and community-owned buildings that can provide services during emergencies, such as cooling during heat waves, heating during extreme cold, clean air during wildfire smoke, and such. These hubs might be put at the South Park Community Center, South Park Neighborhood Center, Mini Mart City Park, or other places.
15. Would you or any member of your household use one of these Resilience Hubs during an emergency?
- Yes No Don't know Refused
16. What else would your household like to see offered in these Resilience Hubs during an emergency? _____ Refused
17. What does your household believe is the single most important thing that resilience planners should know about preparing the Duwamish community for climate change? _____ Refused
18. Is there anything else your household would like to share with us? _____

APPENDIX 2: FIGURE DATA

Data from bar graphs is provided below and on the following page.

Question and Figure Number	Percent of Households*	Range**
Figure 2. What are the top three issues of concern for your household?		
Environmental impacts	62%	53%-70%
Crime	49%	42%-55%
Cost of living	45%	38%-53%
Housing affordability	36%	28%-45%
Racial and ethnic inequality	25%	20%-31%
Civil unrest	16%	11%-22%
Healthcare access	16%	11%-24%
Food security	15%	10%-21%
COVID-19	11%	7%-17%
Duwamish Superfund site	10%	5%-17%
Figure 3. Hazards rated of "high concern" by households		
Poor air quality	71%	62%-79%
Extreme heat	53%	44%-61%
Wildfires	46%	36%-57%
Flooding from heavy rains and/or sea level rise	27%	21%-33%
Extreme cold weather or severe winter storms	19%	14%-26%
Sewage overflow during rain incidents	15%	9%-23%
Contaminated local food sources	14%	10%-21%
Earthquakes	11%	7%-17%
Droughts or water shortages	10%	6%-18%

*Percentages have been rounded to the nearest percent.

** The range represents the values above and below which we have strong certainty the actual percentage of households is. This range is called the 95% confidence interval.

Question and Figure Number	Percent of Households*	Range**
Figure 4. What are your top 3 information sources about disasters/ environmental hazards?		
Internet	65%	56%-74%
Social media	51%	42%-61%
Friends/family/word of mouth	42%	33%-53%
TV	29%	21%-40%
Text message/alert	27%	20%-36%
Cell phone	26%	19%-34%
Radio	23%	16%-30%
Newspaper	16%	11%-23%
Community health clinic	6%	3%-11%
Figure 7. Which three actions should be prioritized to increase climate and community resilience in your community?		
Support community-centered/led projects	62%	53%-70%
Green infrastructure	48%	42%-55%
Flood protection	45%	38%-53%
Improved stormwater management	16%	11%-22%
Improved transit	11%	7%-17%

**Percentages have been rounded to the nearest percent*

*** The range represents the values above and below which we have strong certainty the actual percentage of households is. This range is called the 95% confidence interval.*